UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/835,498	04/16/2001	Ki Young Oh	P/2292-43	5377

2352 7590 06/12/2003

OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK, NY 100368403

EXAMINER
SONG, MATTHEW J

ART UNIT	PAPER NUMBER
1765	14

DATE MAILED: 06/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application N .	Applicant(s)	
	09/835,498	OH ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Peri d f r Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 June 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) *5-11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

[redacted]

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan et al (US 5,879,574) in view of Nishizawa et al (US 6,464,793), Tsuchimoto (US 3,916,034) and Powell et al (US 6,287,643).

Sivaramakrishnan et al discloses a Chemical vapor deposition (CVD) apparatus includes a susceptor **25** installed inside the reactive chamber, a heater/lift assembly **30** and a remote microwave plasma system **55** to deposit plasma enhanced CVD films by inputting deposition reactive gases into system **55** via input line **57** (col 14, ln 20-25). Sivaramakrishnan et al also discloses for plasma processes the CVD apparatus will include a gas feed-through box housing gas passages **83**, **85** to enable the application of high voltage RF power to the gas box (col 26, ln 40-45). Sivaramakrishnan et al also discloses a vacuum pump is activated to generate vacuum pressure within a pumping channel, thereby drawing the process gases and plasma residue out of the processing chamber through a exhaust port **361** (col 35, ln 33-37 and Fig 4 and 8), where the exhaust port reads on applicant's gas outlet. Sivaramakrishnan et al also discloses a process selector subroutine **153** identifies the desired set of process parameters needed to operate the process chamber, where the process parameters include process gas composition and flow rates, temperature, pressure, plasma composition and chamber wall temperature (Fig 1D and col 17, ln

20-35). Sivaramakrishnan et al discloses a process gas control subroutine **163** for controlling the process gas composition and flow rates, which reads on applicant's gas supply controller (col 18, ln 50-67) and heat control subroutine **167** for controlling the temperature (col 19, ln 58-67), which reads on applicant's temperature controller. Sivaramakrishnan et al also teaches a chamber with a ceiling (Fig 1A).

Sivaramakrishnan et al does not disclose at least two gas supply controllers respectively installed at the gas supply pipes to supply the material gases alternately into the chamber.

In a semiconductor crystal growth apparatus, note entire reference, Nishizawa et al teaches a vessel **1** includes nozzles **4** and **5** for introducing gaseous compounds, where the nozzles **4** and **5** are provided with on-off valves **6** and **7** for controlling the introduced amounts of gaseous compounds. Nishizawa et al also teaches a control unit **18** controls the opening and closing of the valves **6** and **7** for alternately and repeatedly introducing gases (col 4-5 and Fig 3). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Sivaramakrishnan et al with Nishizawa et al to grow an epitaxial layer having a desired thickness can be attained with precision as precise as a single molecular layer (col 4, ln 60-67) and to prevent undesired reactions between two or more source gases.

The combination of Sivaramakrishnan et al and Nishizawa et al does not disclose at least two remote plasma generators installed outside the reactive chamber.

In a method of transporting plasma to a substrate to grow a single crystal of material on a substrate, note entire reference, Tsuchimoto teaches two or more selected materials are turned into separate ionized plasmas in separate plasma generating chambers **1a** and **1b** (Abstract and Embodiment 2). It would have been obvious to a person of ordinary skill in the art at the time of

[redacted]

the invention to modify the combination of Sivaramakrishnan et al and Nishizawa et al with Tsuchimoto because a plurality of materials, which cannot coexist in a single plasma generator can be separately turned into the corresponding plasma (col 9, ln 1-67).

The combination of Sivaramakrishnan et al, Nishizawa et al, and Tsuchimoto does not teach one of the gas supply pipes surrounds another of the gas supply pipers, the gas supply pipes being arranged to penetrate the ceiling of the reactive chamber through a common inlet so as to extend to a position above the susceptor.

In an apparatus for injecting atomic species in a plasma reactor, note entire reference, Powell et al teaches a coaxial injector tube comprising an outer tube **72** and an inner tube **84** used for importing gas to a chamber (col 7, ln 55 to col 8, ln 67). Powell et al also teaches the gas tubes penetrate the ceiling of a chamber **86** through a common inlet so as to extend to a position above a susceptor **92** (Fig 5). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Sivaramakrishnan et al, Nishizawa et al, and Tsuchimoto with Powell's injector tube because concurrent injection increases uniformity of distribution of reactant gas species at a wafers surface (col 8, ln 3-15).

Referring to claim 3, the combination of Sivaramakrishnan et al, Nishizawa et al, Powell et al and Tsuchimoto teaches a heater/lift assembly **30**.

Referring to claim 4 the combination of Sivaramakrishnan et al, Nishizawa et al, Powell et al and Tsuchimoto teaches a vacuum pump attached an exhaust port.

[redacted]

3. Claims 1, 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan et al (US 5,879,574) in view of Nishizawa et al (US 6,464,793), Tsuchimoto (US 3,916,034) and Schmitt et al (US 5,356,672).

The combination of Sivaramakrishnan et al, Nishizawa et al, and Tsuchimoto teach all of the limitations of claim 1, as discussed previously, except the combination of Sivaramakrishnan et al, Nishizawa et al, and Tsuchimoto does not teach one of the gas supply pipes surrounds another of the gas supply pipers, the gas supply pipes being arranged to penetrate the ceiling of the reactive chamber through a common inlet so as to extend to a position above the susceptor.

In a method of depositing a thin film, note entire reference, Schmitt et al teaches a gas jet apparatus **14** configured on a port **16** of a wall of a vacuum chamber **12** and the apparatus is comprised of a preferably cylindrical large nozzle **19** with an interior cavity **20**, which receives gas from a reservoir **22**. Schmitt et al also teaches a small nozzle **30** is coaxial with the gas jet apparatus receives gas from a reservoir **34** (col 3, ln 60 to col 4, ln 67). Schmitt et al also teaches the gas supply pipes being arranged to penetrate the ceiling **18** of the chamber **12** through a common inlet **16** so as to extend to a position above a susceptor **44** (Fig 1). It would have been obvious to a person of ordinary skill in the art at the time of the invention the combination of Sivaramakrishnan et al, Nishizawa et al, and Tsuchimoto with Schmitt et al's gas jet apparatus because concurrent injection increases uniformity of distribution of reactant gas species at a wafers surface.

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan et al (US 5,879,574) in view of Nishizawa et al (US 6,464,793), Tsuchimoto (US 3,916,034) and

[redacted]

Powell et al (US 6,287,643) or Sivaramakrishnan et al (US 5,879,574) in view of Nishizawa et al (US 6,464,793), Tsuchimoto (US 3,916,034) and Schmitt et al (US 5,356,672) as applied to claim 1 above, and further in view of Amano et al (US 5,948,485).

The combination of Sivaramakrishnan et al, Nishizawa et al, Powell et al and Tsuchimoto or the combination of Sivaramakrishnan et al, Nishizawa et al, Tsuchimoto and Schmitt et al teaches all of the limitations of claim 2, except a grounding unit connected to the upper container and lower container to clean the inside of the chamber and a RF power generator connected to the susceptor to apply an RF power to the susceptor.

In an apparatus for plasma deposition, Amano et al teaches a plasma process apparatus includes a container **2** divided into two parts, a plasma chamber **21** and a reaction chamber **22**, where the vacuum container **2** is grounded at zero potential. Amano et al also teaches aluminum stage **52** for use as a susceptor and the stage is connected with a radio-frequency power supply unit **61** for plasma lead-in through a blocking capacitor. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Sivaramakrishnan et al, Nishizawa et al, Powell et al and Tsuchimoto or the combination of Sivaramakrishnan et al, Nishizawa et al, Tsuchimoto and Schmitt et al with Amano's susceptor connected with a radio-frequency power supply because ions are confined to the target object on the susceptor (col 5, ln 1-10). Also it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Sivaramakrishnan et al, Nishizawa et al, Powell et al and Tsuchimoto or the combination of Sivaramakrishnan et al, Nishizawa et al, Tsuchimoto and Schmitt et al with Amano's grounded container because it protects the

integrity of the chamber and the chamber circuitry from any static discharge or induced electrical currents that may build in or on the chamber.

Response to Arguments

5. Applicant's arguments filed 6/2/2003 have been fully considered but they are not persuasive.

Applicant's argument that Sivaramakrishnan et al nor Adams et al teach a reactive chamber having an upper and a lower container junctioned by an O ring has been considered but has not been found persuasive. The limitation of a reactive chamber having an upper and a lower container junctioned by an O ring has been deleted from claim 1 in Amendment B filed on 5/12/2003 and does not require consideration.

6. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Solomon et al (US 6,179,913) teaches a compound nozzle **33**, where an outlet **34b** is completely encircled by an outlet **32b** and the outlet **34b** is coaxial with outlet **32b** (col 4, ln 55-67 and Figs 2-4).

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS
June 10, 2003

ROBERT KUNEMUND
PRIMARY EXAMINER